WELDING, CUTTING & BRAZING OXYGEN & ACETYLENE TANKS

HAZARDS AND RULES

Base Materials - Hazards & Impacts

Many hazards are involved in compressed gas handling, storage, and use. Compressed gases are potential energy that is being stored for later use. That energy may be purposely released in order to perform work, or may be accidentally released by container failure or other causes.

When the potential energy from an acetylene tank is accidentally released, it is released at an uncontrolled rate, which may result in fire or an explosion. Oxygen is not flammable, but is a catalyst for burning (i.e., oxygen allows flammable or combustible materials to burn more readily.)

In addition to fire and explosion hazards, there are a number of chronic health effects that may result from welding operations, depending upon the type of welding done and the type of metals being welded. Exposure to the radiation/light generated by the welding process causes damage to the eyes, and skin exposure to ultraviolet radiation can result in severe skin burns. Fumes from both the welding materials (e.g., the gases, welding electrodes, etc.) and the metals being welded can also cause a wide range of adverse health effects, some of which are discussed below.

Additives and Contaminants - Hazards & Impacts

As previously stated, a wide range of adverse health effects may be caused by inhaling welding fumes. The parts that you weld may have been treated with a number of constituents, including, but not limited to, the following:

- cadmium (frequently used as a rust-preventive coating or as an alloy)
- iron oxide (used as an alloy)
- mercury (used to coat metals to prevent rust)

During the welding process, fumes or vapors from these constituents are released, potentially causing irritation of nasal passages, throat and lungs; emphysema; kidney damage; and death.

For more information on welding's adverse health effects, obtain a copy of "Welding Heath Hazards" from the Department of Labor's web site or the Fax-On-Demand system.

Regulatory Overview

The Department of Fire & Building Services, OSHA and DOT regulate welding operations and materials. The Department of Fire & Building Services requires your shop to be properly classified for welding operations and also requires that flammable and combustible materials are properly stored and used.

OSHA has the vast majority of welding-related regulations. These regulations range from equipment storing and handling requirements to providing personal protective equipment to all

employees whom may view the welding operation. And lastly, DOT requires that tanks be properly labeled and secured when in transit.

MANAGEMENT RESPONSIBILITIES

Listed below are the management requirements that you must follow. Also listed are suggested practices that you should follow in order to provide an additional measure of safety to your employees and others who come into contact with welding operations or equipment.

You Must:

! ensure that your building meets the correct building code classification for welding operations. If your shop does any type of welding, more stringent building codes will apply. Contact the Plan Review Division of the Department of Fire & Building Services for more information. [Fire & Building Services]

You Must:

General: [OSHA]

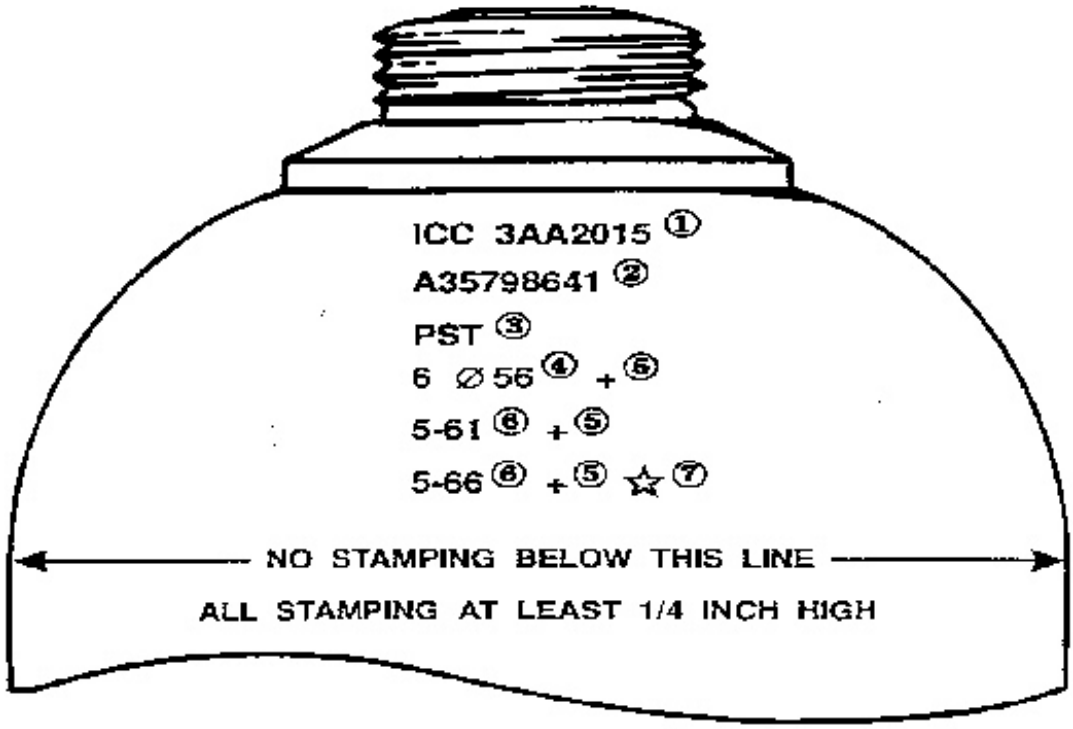
- not mix air or oxygen with flammable gases prior to consumption, except at the burner or in a standard torch.
- not use oxygen for any operation except to support combustion when used with a fuel gas.
- ensure that valve protection caps (when the cylinder is designed to accept such cap) are in place and are hand tight, except when in use or connected for use.
- not drop, strike or allow cylinders to strike each other violently.
- not use valve protection caps for lifting cylinders.
- not allow cylinders to come into contact with electrical circuits.
- not use excessive force to open cylinder valves.
- not use a cylinder that leaks, is bulging, has defective valves or safety devices, shows evidence of physical abuse, fire or heat damage, or has rust or corrosion, unless the cylinder is properly repaired and re-qualified for use. If you have a damaged cylinder, ask your supplier to pick it up and provide you with a new one. Do not attempt to make repairs to cylinders or valves.
- not tamper with safety devices in cylinders or valves yourself.
- not attempt to fill or refill a cylinder yourself. No person, except the owner of the cylinder, or person authorized by him, shall refill a cylinder.
- keep cylinder valves, couplings, regulators, hoses and apparatus free from oily or greasy substances. Do not lubricate cylinder valve threads with any compound prior to connecting a regulator or manifold.

Labeling: [OSHA]

- not tamper with the cylinder's numbers and/or stamping.
- label or identify any leaking cylinders (as leaking) and notify the cylinder supplier.
- ensure that all cylinders have the proper content identification labels and the filler's or distributor's name is identified. The following information must be included:
  1) Either DOT or ICC markings. New cylinders must read "DOT." "3AA" indicates specification number required by DOT.

"2015" is the marked service pressure.

2) Serial number (no duplications are permitted.)
3) Symbol of manufacturer, user, or purchaser.
4) "6 56" is the month and year that the cylinder was manufactured. The circle with a diagonal line through it is the cylinder inspector's official mark.
5) Plus mark (+) indicates that DOT will allow the cylinder to be 10% overcharged.
6) Dates that the cylinder was tested and re-qualified for use. Cylinders must be tested every 10 years.
7) Five-pointed star indicates that the cylinder was retested after being in service for 10 years. Each star represents a separate retest at intervals of 10-years.



Cylinder storage: [OSHA]

- store cylinders away from radiators and all other sources of heat, including overhead space heaters.
- store cylinders inside in a well-protected, well-ventilated, dry location at least 20 feet away from highly combustible material such as oil, grease, paint and mineral-based solvents. Cylinders must be stored in assigned locations that are identified for their storage. This area must be well lighted and away from elevators, stairways, gangways, high traffic walkways and drives. The area must be free of falling objects and free of access by unauthorized persons.
- not store empty oxygen and fuel gas cylinders together. Close the valves of empty cylinders and treat and store them, as you would full cylinders. Full and empty cylinders must be identified accordingly.
- separate cylinders with leaking valves no less than 25 feet from people and buildings. Label or identify the cylinders as leaking and notify your supplier.

Acetylene storage:

- not store more than 2,000 cubic feet of fuel gas in cylinders (fuel gas includes acetylene) unless your shop is equipped with special storage rooms. If you wish to store more than 2,000 cubic feet of fuel gases, contact BuSET, the Plan Review Division of the Department of Fire & Building Services, or CTAP for assistance.
- store acetylene cylinders with valve ends up.

Oxygen storage:

- not store oxygen cylinders near highly combustible material, such as oil, grease, paint and mineral-based solvents. Cylinders must be stored with valve ends up and must be placed on a solid platform or floor (not on wooden structures or on asphalt.) Cylinders must be retained by metal chain or steel wire cable without slack to prevent falling.

- ensure that stored oxygen cylinders are separated from fuel gas cylinders (including acetylene) by a distance of at least 20 feet or by a non-combustible barrier at least 60" (5 feet) high with a fire burn rate of at least one half hour (30 minute) minimum. The non-combustible barrier must be made of concrete or steel sheeting and must be tight to the floor and the back-adjoining wall. This barrier must extend out past the cylinders being stored.

Welding area: [OSHA]

- ensure that the welding area (i.e., the area within 35 feet of the welding operation) is free of combustible material.
- ensure that a fire watcher is designated when welding and cutting is performed in locations where fires might develop.
- ensure that floors, walls and ceiling cracks and opening are protected from entry by sparks and hot slag.

Cylinder Use: [OSHA]

(Note that the supervisor is responsible for the safe handling of cutting and welding equipment and the safe use of the cutting and welding processes.)

- before connecting a regulator to a cylinder valve, ensure the valve is opened slightly and closed immediately (to blow out the fitting.) Stand to one side of the valve outlet of the secured supported cylinder, away from all heat sources.
- not use a hammer or wrench to open cylinder valves. Contact the supplier if the valves cannot be opened by hand.
- not open acetylene cylinder valves more than 1 - 2 turns of the valve spindle.
- ensure that a pressure reducing device (regulator)is used when using any compressed gas cylinder. The type of regulator used must match the cylinder and gas being used.
- ensure that cylinders not having fixed hand wheels are equipped with keys, handles or non-adjustable wrenches on the valve stem at all times while the cylinder is in service.
- keep cylinders far enough away form the actual cutting and welding operation so that sparks, slag and flame will not reach them. If this is not possible, a flameproof barrier must be used to shield the cylinders.
- ensure that the welding equipment's hook-up and use comply with the requirements of the manufacturer.
- protect welding machine terminals from accidental electrical contact by personnel or metal objects.
- ensure that welding equipment is ground.
- ensure that all electrical connections in the welding circuit are mechanically secure and maintain adequate current carrying capacity.
- ensure that electrode holders are in good condition and that all conductive parts are insulated from the operator.
- remove welding electrodes from the electrode holder when not in immediate use.
- bleed pressure from the regulator and the system before removing the regulator.
- close cylinder valves when work is finished, or before going to lunch, extended break, or leaving work for the day.

Personal Protective Equipment: [OSHA]

- ensure that cutting and welding operators wear the protective equipment necessary to be protected from flash burn, arc burn, arc radiation, etc.
  - The appropriate protective clothing required for any welding operation will vary with the size, nature and location of the work to be performed. Clothing materials should always provide maximum protection from sparks and hot metal. Protective eyewear, safety shoes, fire-resistant clothing and fire-resistant gauntlet gloves are recommended. Additionally, shirts should have long sleeves, no pockets and should be worn outside of the trousers with the collar buttoned. The trousers should not have cuffs and should extend down to the safety shoes.
- ensure that employees outside the weld area are provided with the same protection as listed above if these employees enter the weld area.

Note that OSHA's *Filter Lens Shade Number Guide* follows this section. Additional information regarding personal protective equipment is available via the Department of Labor's web site or the Fax-On-Demand system. You may also contact BuSET or CTAP for assistance.

Transporting cylinders: [DOT]

- close cylinder valves prior to transporting.
- secure cylinder against falling during transport.
- when transporting gases, label the shipment to meet DOT requirements. Refer to IDEM's web site for a listing of DOT Shipping Descriptions. [DOT]

You Should:

- store your oxygen and acetylene tanks so they are chained in place and located inside storage cages, or strap each tank to a welder's dolly.
- visually inspect compressed gas cylinders to ensure they are in safe condition.
- check for leaks before using. Spraying a soap and water solution around the base of the collar may do this. If the tank is leaking, the solution will "bubble" as a result of the gas being released.
- not use acetylene at a pressure in excess of 15 psig.
- ensure that employees in charge of the oxygen or fuel-gas supply equipment have been judged competent by the employer before being left in charge.
- make the rules and instructions covering the operation and maintenance of oxygen or fuel-gas supply equipment readily available to employees performing this type of work.

FILTER LENS SHADE NUMBER GUIDE

WELDING OPERATION	SHADE NUMBER
Shielded Metal-Arc Welding, up to 5/32" (4mm) electrodes	10
Shielded Metal-Arc Welding, 3/16 to 1/4" (4.8 to 6.4mm) electrodes	12
Shielded Metal-Arc Welding, over 1/4" (6.4mm) electrodes	14
Gas Metal-Arc Welding (Nonferrous)	11
Gas Metal-Arc Welding (Ferrous)	12
Gas Tungsten-Arc Welding	12
Atomic Hydrogen Welding	14
Carbon Arc Welding	10-14
Torch Soldering	2
Torch Brazing	3 or 4
Light Cutting, up to 1" (25 mm)	3 or 4
Medium Cutting, 1" to 6"(25 to 150 mm)	4 or 5
Heavy Cutting, over 6" (150 mm)	5 or 6
Gas Welding (light), up to 1/8" (3.2 mm)	4 or 5
Gas Welding (medium), 1/8" to 2" (3.2 to 12.7 mm)	5 or 6
Gas Welding (heavy), over 2" in (12.7 mm)	6 or 8

Note: In gas welding or oxygen cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the operation spectrum.